

Appendix A

Lake Superior Areas of Concern and Remedial Action Plan Summaries



Dredging, Duluth, MN
Photograph by: Minnesota Sea Grant

Lake Superior Lakewide Management Plan
2000

Appendix A

Lake Superior Remedial Action Plans and Areas of Concern Summaries

Deer Lake

Area of Concern

Ishpeming, MI;Marquette,MI;Negaunee,MI

Background

Deer Lake is a 906 acre impoundment in central Marquette County near Ishpeming. The Area of Concern (AOC) includes the Carp River watershed, including Carp Creek, Deer Lake, and the Carp River downstream about twenty miles to Lake Superior in Marquette.



In 1981, fish in Deer Lake were discovered to contain mercury in concentrations exceeding the Michigan Department of Public Health (MDPH) fish consumption level of 0.5 mg/kg and the U.S. Food and Drug Administration consumption advisory level of 1.0 mg/kg. Mercury from historic and recent mining practices, including mercury used in ore research was discharged to Ishpeming Waste Water Treatment Plants and local streams contaminating sediments and water in the AOC. Other potential sources of mercury to Deer Lake fish include atmospheric deposition, gold ore processing and tailings, and local bedrock. Remediation, including draw down of Deer Lake, was implemented in 1984-1986. Mercury levels in fish initially increased, and then decreased until 1995. Thereafter mercury levels in fish leveled off or again increased. The concentration of mercury in Deer Lake fish presently varies from less than the 0.5 mg/kg MDPH fish consumption advisory level to above 1.5 mg/kg. The higher concentrations tend to be in larger, older Northern Pike. Known sources of mercury to the lake include research laboratories operated by The Cleveland-Cliff Iron Company (CCIC) and the Ropes Gold Mine. Nutrient loadings from the three old Ishpeming wastewater treatment plants accelerated eutrophication (enrichment) of the lake leading to nuisance algal blooms. The treatment plants were replaced in 1985, but the lake remains highly productive. Due to the high productivity, the lake currently supports trophy catch and release fisheries although it is illegal to possess fish. Deer Lake continues to recover from effects of past municipal and industrial discharges. Water quality conditions have greatly improved, but elevated levels of mercury are still a problem.

Beneficial Use Impairments

A 1987 Remedial Action Plan (RAP) was written by Michigan Department of Natural Resources (MDNR), now the Michigan Department of Environmental Quality (MDEQ). This RAP described problems known at the time and identified actions and studies needed to further define and remediate those problems. However, the RAP was written before the 1987

Beneficial Use Impairments

✓ Restrictions on fish and wildlife consumption.	Eutrophication or undesirable algae.
Tainting of fish and wildlife flavor.	Restrictions on drinking water consumption, or taste and odor.
Degradation of fish and wildlife populations.	Beach closings.
Fish tumors or other deformities.	Degradation of aesthetics.
Bird or animal deformities or reproductive problems.	Degradation of phytoplankton and zooplankton populations.
Degradation of benthos.	Added cost to agriculture and industry.
Restrictions on dredging activities.	Loss of fish and wildlife habitat.

amendments to the Great Lakes Water Quality Agreement (GLWQA) which outlined new guidelines for RAPs including the identification of potential beneficial use impairments. The primary impaired uses of the AOC are restrictions on fish consumption and contaminated sediments. Additionally, dredging restrictions might apply. Although the lake is still eutrophic, Secchi disk readings continue to improve.

RAP Status

The PAC is currently in the process of writing a RAP Update and will include the identification of beneficial use impairments as outlined in the GLWQA. Issues relating to the AOC and goals for the PAC have been identified.

RAP Milestones

- ✓ 1981: Fish consumption and health advisories were issued by Michigan Department of Community Health.
- ✓ 1984-1987: Remediation plan implemented including lake draw down and treatment.
- ✓ 1985: Listed as an AOC.
- ✓ 1987: Deer Lake Remedial Action Plan written by the MDNR.
- ✓ 1987-2003: Studies by the CCIC and MDEQ concerning mercury concentrations in fish, sources, effects, and remediation options and likely impact on the Carp River Watershed.
- ✓ 1997: Deer Lake Area of Concern Public Advisory Council was formed, bylaws adopted, officers elected, and committees assigned for beneficial use impairment identification..
- ✓ 1998: Sediment traps on cleaning schedule.
- ✓ 1999 & 1998: Beaver dam removal by private citizens with Boy Scouts and PAC involvement.
- ✓ 1999 & 1998: Stream and lake monitoring with public schools and PAC.
- ✓ 1999 & 1998: Lakeshore and island cleanups.
- ✓ 1999: Fish advisory and mercury cautionary signage, designed, installed and maintained.
- ✓ 1999: Committee reports for the RAP Update completed.

Priorities

A primary goal is to identify and restore beneficial uses of the Carp River watershed that led to the lake's designation as an AOC. Goals of the PAC include addressing the 14 potential Beneficial Use Impairments, revision of the RAP, restoration of impaired beneficial uses and promotion of best management practices for the entire watershed through identification and communication. In 2000, the RAP will be updated, which will aid agency staff when management strategies come up for review. The PAC will assist with the release of state and the CCIC negotiations for public review and comment. Signage maintenance around the lake will continue along with continued special projects and educational outreach.

Remediation

Deer Lake sediments and fish are contaminated with mercury. A mitigation plan was implemented by CCIC in 1984, but the state is not satisfied with the results. The State is currently working with CCIC to develop and assess data to determine whether additional mitigation is appropriate. MDEQ expects to make a decision this spring on whether additional data is needed; additional mitigation, possibly including the removal of sediments is needed; or Deer Lake fish/sediment contamination doesn't require additional mitigation. The Clean Michigan Initiative (CMI) bond included Deer Lake as a potential site for sediment remediation. Both MDEQ and CCIC are conducting studies in the lake. The studies will be evaluated winter 1999-2000 and a decision should be made early in 2000 on whether sediment removal or remediation by the company or MDEQ through CMI is necessary.

Habitat/Resource Management

The lake supports a trophy catch and release fisheries. The recommendation to maintain the catch and release fisheries has wide support, but not consensus within the PAC. The PAC recommends that the current lake level be maintained. Eagles have had nest success the past two years after a considerable absence. Studies and nest observations are ongoing to determine true success. The PAC supports the upgrade or relocation of the boat launch area.

Human Health

The PAC has developed fish advisory and mercury cautionary signage for the AOC. They have designed, installed and maintained the signage around the watershed.

Stewardship Sustainability

Without federal and state support the PAC will cease to exist.

Education and Outreach

The PAC has updated their AOC pamphlet used for public outreach and education. They also plan to develop fact sheets related to the beneficial use impairments.

Research Projects/Data Gaps

The state and CCIC are concurrently conducting studies within the AOC to help identify and define the problems, and solutions related to contaminated sediments and fish issues. The PAC has and will continue to monitor water quality data related to eutrophication. Nonpoint source problem areas will be identified within the watershed.

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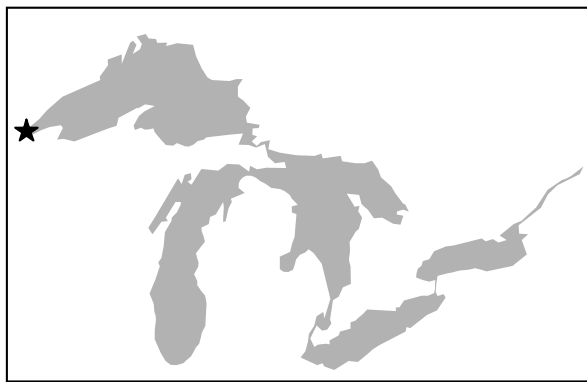
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St. Louis Bay/River Area of Concern

Duluth, MN;Cloquet, MN;Superior,WI;USA

Background

The St. Louis River, the largest U.S. tributary to Lake Superior, drains 3,634 square miles, entering the southwestern corner of the lake between Duluth, Minnesota and Superior, Wisconsin. The river flows 179 miles through three distinct areas: coarse soils, glacial till and outwash deposits at its headwaters; a deep, narrow gorge at Jay Cooke State Park; and red clay deposits in its lower reaches. Below the Fond du Lac dam, as the river approaches Lake Superior, it slows down and spreads out, covering 12,000 acres, like a freshwater estuary. The upper estuary has some wilderness-like areas, while the lower estuary is characterized by urban development, an industrial harbor and a major port. The lower estuary includes St. Louis Bay, Superior Bay, Allouez Bay and the lower Nemadji River.



The St. Louis River Area of Concern (AOC) is the area being addressed by the St. Louis River System Remedial Action Plan (RAP), which focuses primarily on the lower 39 miles of the St. Louis River below Cloquet, Minnesota. The RAP began in 1989 as a collaborative effort between the Minnesota Pollution Control Agency (MPCA) and the Wisconsin Department of Natural Resources (WDNR). At that time, the agencies created a Citizens Advisory Committee (CAC). In 1997, with agency assistance, the CAC opened its doors as an independent nonprofit organization known as the Citizens Action Committee. Many of the original citizen and agency partners are still active in the RAP and CAC.

Beneficial Use Impairments

The RAP process determined that nine of 14 identified beneficial uses were impaired. Some impairments were associated with the physical loss and degradation of habitat, with the estuary having lost an estimated 7,700 (of 12,000) acres wetland and open water habitat since settlement. Other problems were related more to pollution and toxicity. For years, the river smelled bad from industrial discharges. That changed in 1978, when the Western Lake Superior Sanitary District wastewater treatment plant began operation. Nevertheless, pollution continues to come from sources such as contaminated sediments, abandoned hazardous waste sites, poorly designed or leaky landfills, airborne deposition, industrial discharges, chemical spills, improperly sewered wastes, surface runoff.

Beneficial Use Impairments

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| ✓ Restrictions on fish and wildlife consumption. | ✓ Eutrophication or undesirable algae. |
| Tainting of fish and wildlife flavor. | Restrictions on drinking water consumption, or taste and odor. |
| ✓ Degradation of fish and wildlife populations. | ✓ Beach closings. |
| ✓ Fish tumors or other deformities. | ✓ Degradation of aesthetics. |
| Bird or animal deformities or reproductive problems. | Degradation of phytoplankton and zooplankton populations. |
| ✓ Degradation of benthos. | Added cost to agriculture and industry. |
| ✓ Restrictions on dredging activities. | ✓ Loss of fish and wildlife habitat. |

RAP Status

Forty-three recommendations were published in 1995. Implementation began immediately and continues today. Some recommended actions are well underway, such as: (1) land acquisition, with 34,000 acres bordering the river permanently protected by purchase or donation, (2) connection of Fond du Lac, MN, with a high percentage of failing septic systems, to the Western Lake Superior Sanitary District, (3) programs to reduce sewage bypasses by keeping storm water out of sanitary sewer systems, and (4) development of a habitat plan for the lower St. Louis River.

RAP Milestones

- ✓ April 1992: Stage One RAP document (identification of problems) published.
- ✓ April 1995: RAP progress report published, including 43 Stage Two recommendations.
- ✓ June 1997: The RAP's Citizens Advisory Committee became the nonprofit Citizens Action Committee.

Priorities

Contaminated sediments are an important priority in the AOC. Studies conducted by state and federal agencies in the late 1990s have provided a good understanding of the type, severity and location of contaminated sediments. These studies include work done at two Superfund sites on the Minnesota side. Some upland clean-ups have occurred. Remediation of contaminated sediments is expected to be underway at sites on both sides of the state line by 2005.

Mercury is a contaminant of particular concern in the St. Louis River. A new project - the St. Louis River Watershed TMDL Partnership, or SLRWTP- will use the new "TMDL" process to develop a total maximum daily load (TMDL) for mercury. The TMDL process is designed to improve impaired waters such as the St. Louis River, where all facilities with discharge permits are operating within their permitted limits, yet pollutant levels exceed state standards. The TMDL process will complement the mercury-reduction work that is already taking place in the watershed.

Habitat restoration and protection are also important priorities. Although the estuary has suffered extensively from habitat loss and degradation, it also retains tremendous habitat value. Because habitat issues are such a high priority, a comprehensive habitat plan is being developed to enhance the biological diversity and ecological integrity of the lower St. Louis River. The project will provide an estuary-wide vision for resource management and conservation, a consensus list of conservation and management objectives, targets and actions; and a project that is ready to submit for funding.

Public involvement and outreach have always been important components of this RAP. A host of partners are working together to improve the St. Louis River. These include the U.S. EPA, Minnesota Pollution Control Agency, Minnesota DNR, Wisconsin DNR; city; county and tribal governments, Minnesota and Wisconsin universities and Sea Grant Programs, the St. Louis River Citizens Action Committee, River Watch Project, River Quest, Harbor Technical Advisory Committee, U.S. Army Corps of Engineers, and numerous private businesses and individuals.

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St. Marys River Area of Concern

Sault Ste. Marie, MI, USA; Sault Ste. Marie, ON, Canada



Background

The St. Mary's River is a 112 km connecting channel between Lakes Superior and Huron. The Area of Concern extends from the head of the river at Whitefish Bay (Point Iroquois - Gros Cap), downstream through the St.

Joseph Channel to Humburg Point on the Ontario side, and to the straits of Detour on the Michigan side.

Severe impairment of water quality, sediment, and biota remain on the Ontario shoreline due to major point source discharges.

Beneficial Use Impairments

Impaired uses are identified in the table to the right. Restrictions on fish consumption are due to mercury and PCBs. Fish populations have been impacted heavily by the parasitic sea lamprey, an introduced species. Also, benthic invertebrates have shown signs of PAH and PCB contamination, most likely from sediments. White suckers have exhibited liver tumors – another sign of exposure to contaminated sediments. The benthic communities on the Michigan side appear to be healthy, while localized areas on the Ontario side have exhibited significant degradation. Contaminants of concern include oils and greases, suspended solids,

metals, phenols, ammonia, bacteria, and PAHs. Contaminated dredged spoils from the Algoma Steel Boat Slip must be disposed of in an approved waste disposal site, and several other sites have exceeded contaminant level standards. Eutrophication and algae continue to be an issue in the vicinity of the East End Water Pollution Control Plant. Beach sites close to Algoma on the Canadian side have been impacted by PAHs, while in Michigan total body contact activities are periodically impaired due to elevated bacteria levels. Some aesthetic degradation has occurred on both sides due to oil slicks and floating algae scum. Significant loss of fish and wildlife habitat has occurred as a result of shoreline alteration, industrialization, urbanization, agricultural impacts, and shipping activities, particularly in the St. Marys rapids.

Beneficial Use Impairments

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| ✓ Restrictions on fish and wildlife consumption. | ✓ Eutrophication or undesirable algae. |
| Tainting of fish and wildlife flavor. | Restrictions on drinking water consumption, or taste and odor. |
| ✓ Degradation of fish and wildlife populations. | ✓ Beach closings. |
| ✓ Fish tumors or other deformities. | ✓ Degradation of aesthetics. |
| ✓ Bird or animal deformities or reproductive problems. | Degradation of phytoplankton and zooplankton populations. |
| ✓ Degradation of benthos. | Added cost to agriculture and industry. |
| ✓ Restrictions on dredging activities. | ✓ Loss of fish and wildlife habitat. |

RAP Status

Results from ongoing projects pertaining to sediment remediation and habitat restoration, along with Task Team reports, are being incorporated into the Stage 2 Report for the RAP. Some progress has been made toward restoring beneficial uses. The Cannelton Superfund site has been restored for re-use by the city of Sault Ste. Marie and its citizens. Once remediated, the site may support light industry, residential homes, or park areas. Certain use restrictions will apply to various parts of the site to prevent contamination from affecting human or ecosystem health. The sea lamprey control efforts will help restore impaired fisheries in

the St. Marys River as well as northern Lake Huron and Lake Michigan. This will be a long-term, continuing effort since the opportunistic lamprey can take quick advantage of any lapse in larvae and adult control measures. Combined sewer separation in Sault Ste. Marie, Michigan has already eliminated the worst of the occasional overflows of sewage to the St. Marys River in Michigan waters. Continued work on this will eventually stop all potential for untreated sewage entering the river, even in the worst run-off events. The steel mill and paper mill in Sault Ste. Marie, Ontario have greatly improved the quality of their effluent due to new provincial guidelines.

RAP Milestones

✓	Stage 1 Report to IJC	submitted May 1992
✓	Public Use Goals	submitted December 1990
✓	Remedial Options Described	submitted April 28, 1993
✓	Draft Stage 2 Report released	December 1999
✓	St. Marys River AOC Michigan Progress Report	issued November 1999

Priorities

RAP recommendations are in reports from RAP Task Teams that addressed issues in the St. Marys River AOC from the spring of 1993 to the fall of 1994. These teams had local, state, provincial and federal representatives from the public and private sectors. Some of the key recommendations are highlighted below:

- Continuation of a technically-focused contaminated sediments task team to support remedial action on sediments;
- Continuation of current sediment monitoring efforts;
- Superfund monitoring of the Cannelton Industries site;
- Upgrade the East End Water Pollution Control Plant (Canada) to secondary treatment;
- Reduce storm water infiltration to the East End Water Pollution Control Plant collection system (Canada);
- Address contaminants in storm water discharge systems (U.S. and Canada) through programs for business, industry, and the public;
- Design and implement a monitoring system for storm water;
- Continue the resource center for information on the St. Marys River AOC;
- Develop a range of educational programs;
- Ensure no loss of existing habitat;
- Encourage restoration/rehabilitation of degraded habitat, especially rapids habitat;
- Establish a wildlife monitoring system;
- Define indicator species and habitats within ecosystems;
- Nonpoint source work in tributary watersheds.

Remediation

- Continuation of a technically - focused contaminated sediments task team to support remedial action on sediments.
- Development of a comprehensive Contaminated Sediment Management Plan.
- Delineation and mapping of contaminated sediment zones.
- Identify and control contaminant inputs from the Algoma slag dump.
- Upgrade the East End Water Pollution Control Plant (Canada) to secondary treatment.

Habitat/Resource Management

- Ensure no loss of existing habitat.
- Encourage restoration/rehabilitation of degraded habitat, especially rapids habitat.
- Establish a wildlife monitoring system.
- Watershed Development Plan for Bennett and West Davignon Creeks.
- Restoration of urban watersheds on sides of river.

P2/Nonpoint Source

- Reduce storm water infiltration to the East End Water Pollution Control Plant collection system (Canada).
- Nonpoint source work in tributary watersheds.

Human Health

- Survey of households that use surface water intakes from river.
- Regular testing of bathing beaches for biohazards.

Stewardship Sustainability

- Support the formation and activities of local watershed councils.
- Support the activities of Canadian and American Heritage River teams.

Education and Outreach

- Continue support of the BPAC office/Resource Center for information on the St. Marys River AOC.
- Develop a range of educational programs.
- Address contaminants in storm water discharge systems (U.S. and Canada) through programs for business, industry and the public.

Research Projects/Data Gaps

- Superfund monitoring of Cannelton Industries site.
- Re-sample river sediments every five years to obtain trend with time information.
- Evaluate sediment quality in the Algoma Slip to determine need for further dredging.

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Torch Lake Area of Concern

Houghton,MI;Hancock,MI;Lake Linden,MI;
Hubbell,MI



Background

The Torch Lake AOC is located on the Keweenaw Peninsula. The Area of Concern (AOC) spans the lower portion of the peninsula, encompassing the Keweenaw Waterway, (North Entry, the Portage Lake watershed, and the Torch Lake watershed), portions of two other adjacent watersheds (Trout River and the Eagle River Complex), and several miles of its western Lake Superior shoreline. The AOC boundaries encompass 368 square miles and include a Superfund site.

The unifying problem shared by these areas are widely scattered deposits of copper mining waste materials accumulated over more than 100 years of copper mining, milling, smelting and recovery activities. These wastes occur both on the uplands and in the lake and occur in four forms: poor rock piles, slag and slag enriched sediments, stamp sands, and abandoned mine slurry settling ponds. The associated contaminants are copper, mercury, arsenic, lead, chromium, and other heavy metals.

The largest site within the AOC is Torch Lake (about 2,700 acres in size). Torch Lake had 20% of its volume filled in with over 200 million tons of stamp sands and smelter slag wastes and is part of the Superfund site. For Superfund management purposes, the Superfund site has been grouped into three Operable Units (OU's). OU I includes surface tailings and slag piles on the western shore of Torch Lake. An estimated 440 acres of tailings are exposed surficially in OU I and are located near the towns of Lake Linden, Hubbell/Tamarack and Mason. OU II includes groundwater, surface water, submerged tailings and sediments in Torch Lake, Portage Lake, the Portage Channel, and other water bodies at the Superfund site. OU III includes tailings and slag deposits located in the north entry of Lake Superior, Michigan Smelter, Quincy Smelter, Calumet Lake, Isle-Royale, Boston Pond, Scales Creek, Dollar Bay and Grosse-Point. Quincy Smelter is part of the Quincy Mining Historic District which is proposed as a National Historical Park. The Traprock River, the river that Scales Creek empties into and is a major tributary to Torch Lake, contributed a significant part of the copper found in the water column in the lake.

Beneficial Use Impairments

The Remedial Action Plan (RAP), initially written by the Michigan Department of Natural Resources (MDNR) in 1987, described known problems and identified actions and studies needed to further define and remediate those problems. However, the RAP was written before the 1987 amendments to the Great Lakes Water Quality Agreement's (GLWQA) and did not include the required site-specific evaluation

Beneficial Use Impairments

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| ✓ Restrictions on fish and wildlife consumption. | Eutrophication or undesirable algae. |
| Tainting of fish and wildlife flavor. | Restrictions on drinking water consumption, or taste and odor. |
| Degradation of fish and wildlife populations. | Beach closings. |
| Fish tumors or other deformities. | Degradation of aesthetics. |
| Bird or animal deformities or reproductive problems. | Degradation of phytoplankton and zooplankton populations. |
| ✓ Degradation of benthos. | Added cost to agriculture and industry. |
| ✓ Restrictions on dredging activities. | ✓ Loss of fish and wildlife habitat. |

of the 14 potential beneficial use impairments. The RAP is currently being revised by the Torch Lake Area Public Action Councils Technical Committee. The beneficial uses impairments inferred from the 1987 RAP included restrictions on fish and wildlife consumption, fish tumors or other deformities, contaminated sediments, loss of fish and wildlife habitat, restrictions on drinking water consumption, restrictions on dredging and shipping activities, and degradation of benthos. With a Rap update currently in process, this list is undergoing revision.

RAP Status

The first draft of the RAP update has been completed and distributed by the TLPAC Technical Committee to TLPAC members for review and comment. The selected remedies for the Superfund site were documented in two Record of Decisions (ROD). A ROD for OU I and OU III was completed in 1992 and a ROD for OU II was completed in 1994. Remedies were selected to address the mine tailings, slag piles, Torch Lake itself and other water bodies. The remedies primarily address ecological impacts. The most significant ecological impact is the severe degradation of the benthic communities in Torch Lake as a result of metal loadings from the mine tailings. The primary components of the selected remedy for OU I and OU III include a soil (6 inches of sandy loam soil) and vegetative cover over about 700 acres of tailing and slag piles to reduce metal loadings to Torch Lake and other water bodies in the area. The selected remedy for OU II is no action with natural recovery of the bottom of Torch Lake and other water bodies. Long-term monitoring of the lake is also required as part of the selected remedy for OU I and OU III to measure and verify the lake's recovery progress. Additional components of the selected remedy for OU I and OU III include groundwater monitoring and institutional controls.

The U.S. EPA's funded the remediation at \$15.2 million with 10% state match. Remediation work began in 1999. Monitoring data collection for Torch Lake began during the summer of 1999.

RAP Milestones

- ✓ 1974: First systematic documentation of the presence of tumors and other abnormalities in fish from the Keweenaw Waterway: Tomljanovich, D.A. Growth Phenomena and Abnormalities of the sauger, *Stizostedion canadense*, of the Keweenaw Waterway. M.S. Thesis, Michigan Technological University, Houghton Michigan.
- ✓ 1982: First national disclosure of fish tumors problems in the Keweenaw Waterway: Black, J, et. al. Epizootic Neoplasms in Fishes From a Lake Polluted by Copper Mining Wastes, Journal of the National Cancer Institute Vol. 69, No.4.
- ✓ 1983: The Michigan Department of Public Health announces a consumption advisory for
- ✓ Waterway sauger and walleye because of the presence of tumors of unexplained origin.
- ✓ 1983: The International Joint Commission-Water Quality Board designated the Waterway the Torch Lake Area of Concern.
- ✓ 1986: Contaminated areas within the AOC become designated as Superfund sites.
- ✓ 1987: Torch Lake RAP written by MDNR.
- ✓ 1988: U.S. EPA initiated Remedial Investigation/Feasibility Study for the Superfund site.
- ✓ 1989: Fish consumption advisory for Torch Lake sauger and walleye removed.
- ✓ 1992: Declaration for the Record of Decision for Operable Units I & III.
- ✓ 1994: Declaration for the Record of Decision for Operable Unit II.
- ✓ 1997: Torch Lake Area Public Action Council was formed by public election of stakeholder representatives.
- ✓ 1998: \$15.2 million in federal funding approved with 10% state match.
- ✓ 1998: Remediated breached mine settling pond at Scales Creek, a tributary to Torch Lake, which released thousands of tons of stamp sands and fines.

- ✓ 1998: Fish advisory reinstated for women and children (due to PCB content)
- ✓ 1999: Educational outreach support given to Michigan Technological University -GEM Center
- ✓ 1999: AOC health concerns survey by local Health Department.
- ✓ 1999: Traprock River Remediation plan completed by NRCS project manager.
- ✓ 1999: Monitoring in OU II begun
- ✓ 1999: Lake Linden Superfund Site Remediation completed
- ✓ 1999: First Draft of RAP Update completed by TLPAC technical committee and distributed to TLPAC for review and comment, prior to release to state agencies.

Priorities

The TLPAC's highest priority is to facilitate delisting as both an AOC and a Superfund Site. A draft of the RAP is completed and when approved by the TLPAC will be submitted to MDEQ and U.S. EPA. Remediation efforts by agencies, local governments, private corporations and individuals will continue as funds become available.

Remediation

- The U.S. EPA's Superfund remediation designs for OU I & II were completed by the NRCS in 1998, and the U.S. EPA funded the remediation at \$15.2 million with 10% state match. Remediation work began in 1999 for OUs I and III, and is expected to take approximately five years to complete. No estimate has been made for the amount of time required for the natural recovery of OU II. Monitoring data collection from Torch Lake, which is required to by the Record of Decision, began during the summer of 1999. The monitoring design plan was developed by the U.S. EPA -FIELDS group, along with the Region 5 Superfund, and MDEQ-ERD and SWQD staff. Preliminary data from summer 1999 seems to indicate that the sediments and flocculate remain toxic. The sampling also found little to no benthic invertebrates. The final report on the sampling has yet to be released. Remediation work was completed at the Lake Linden site in the fall of 1999. Scales Creek remediation/stabilization work was completed in the summer of 1998. The Village of Lake Linden has remediated many acres of former Torch Lake industrial sites and stamp sand deposits converting them to public parks, marina facilities, campgrounds, and other public uses. The NRCS Project manager developed a map of the Traprock/Scales Creek watershed that pinpoints nonpoint source problems, stamp sand and slag sources, and other problems impacting the watershed. The manager also has identified and contacted landowners along impacted areas, and worked with the PAC on community outreach and portions of the RAP update. The City of Houghton had developed a canal complex with approximately 30 private residential waterfront lots, the proceeds from the sale of the lots were used to underwrite the cost of the area's remediation. The city is developing non-motorized hiking pathways along the Waterway to increase public access and developed a small, artificial wetland upon a submerged portion of stamp sand adjacent to the waterfront lots. Two local sewage authorities have sited treatment facilities on stamp sand deposits in both Torch and Portage Lakes. They have been permitted to spread the treated sludge on the sands to assist in revegetation while at the same time reducing sludge disposal costs. Two townships plan the remediation and development of several small historically significant Superfund sites into "Cooperating Sites" linked by pathways within the Keweenaw National Historical Park. These sites will help interpret the milling and smelting aspects of the copper industry. Privately financed remediation efforts have also been underway along the Waterway. Real estate companies and private individuals have purchased and have been capping smaller stamp sand deposits for eventual residential development. Sites that in the past have been liabilities are rapidly becoming important revenue producing properties on the public tax rolls.

Habitat/Resource Management

- In the Spring of 1997 the Village of Lake Linden installed a fish spawning reef on a littoral area of stamp sand bank that was subject to significant erosion from wave action. This structure should significantly reduce adjacent shoreline erosion while at the same time improve fish spawning habitat within the lake. The City of Houghton also developed a small, artificial wetland upon a submerged portion of stamp and adjacent to the waterfront lots.

Human Health

- Health concerns survey completed in 1999. The Health Department surveyed local citizens as to health concerns associated with AOC.

Education and Outreach

- Educational outreach matching grant support given to Michigan Technological University-GEM Center by the TLPAC.
- TLPAC created and maintains a web site related to AOC issues.

Research Projects/Data Gaps

- Define human health risks.
- Completed baseline data report from EPA-FIELDS.
- Obtain report from Health Department's health survey.
- Will the vegetative cap cause a pH change in the runoff or ground water potentially causing a change in the bioavailability or methylization of contaminated sediments.
- Address mercury concerns.
- Characterize sediments, including hot spot offshore from the Hubbell smelter.
- Determine sedimentation rate for the lake.
- Traprock River sediment and copper loadings.
- Stamp sand transport along Lake Superior Shoreline on both sides of the peninsula.
- Understanding of copper uptake by plants, both aquatic and terrestrial and the organisms which consume them.
- Identification of leaching rates from stamp sands and other mining wastes which might potentially contaminate the aquifer from which residents draw water from.
- Characterize the state of the phytoplankton and zooplankton communities.
- Identify habitat needs within the AOC

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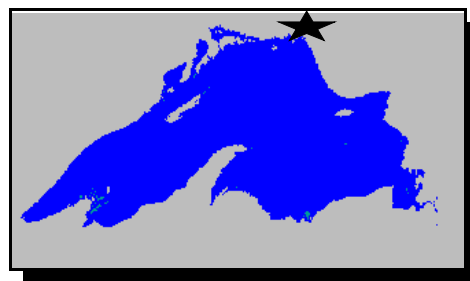
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Jackfish Bay Area of Concern

Terrace Bay, ON, Canada



Background

The Jackfish Bay AOC is located on the north shore of Lake Superior, approximately 250 km northeast of Thunder Bay.

The town of Terrace Bay is the closest community, situated to the west of Jackfish Bay. The AOC consists of a 14 km stretch of Blackbird Creek between the Kimberly-Clark pulp mill and Jackfish Bay including Lake A, Moberly Lake and Jackfish Bay itself. Blackbird Creek has received wastewater discharge from the mill since 1948 and both Lake A and Moberly Lake have experienced significant in-filling with wood fiber and other solids.

Beneficial Use Impairments

Kimberly-Clark effluent, spills, and in-place sediment contamination contribute to the seven (✓) beneficial uses that are impaired or require further assessment in the Jackfish Bay AOC. Fish consumption restrictions are based on a variety of chemicals, including dioxins and furans, attributed to mill effluent. Lake trout populations have declined for a number of reasons including overfishing, sea lamprey predation, and degraded water quality.

White suckers collected from the bay prior to the installation of secondary effluent treatment at the mill had an increased incidence of liver cancer. Reproductive

failure and contaminant levels in herring gulls requires further assessment to determine the cause of this impairment. Sediments in Moberly Lake remain acutely toxic to benthic fauna. Lake trout spawning habitat in Moberly Bay has been destroyed through the deposition of organic materials and chemical contamination of sediments.

Beneficial Use Impairments

- | | |
|--|--|
| ✓ Restrictions on fish and wildlife consumption. | Eutrophication or undesirable algae. |
| Tainting of fish and wildlife flavor. | Restrictions on drinking water consumption, or taste and odor. |
| ✓ Degradation of fish and wildlife populations. | Beach closings. |
| ✓ Fish tumors or other deformities. | ✓ Degradation of aesthetics. |
| ✓ Bird or animal deformities or reproductive problems. | Degradation of phytoplankton and zooplankton populations. |
| ✓ Degradation of benthos. | Added cost to agriculture and industry. |
| Restrictions on dredging activities. | ✓ Loss of fish and wildlife habitat. |

RAP Status

The Jackfish Bay Remedial Action Plan Team and the Public Advisory Committee (PAC) explored a variety of options designed to rehabilitate the AOC, ranging from extensive physical alterations of the Blackbird Creek system to allowing the area to undergo natural rehabilitation while monitoring for incremental gains in environmental quality. Each solution was outlined in the Options Discussion Paper and evaluated on the basis of the potential benefits and disadvantages associated with implementation.

The Stage 2 RAP report has been completed and concludes that the AOC should be monitored for incremental progress with no further intervention at this time. Recovery and delisting of the AOC will not occur until there is a change in the Kimberly-Clark effluent being discharged to the Blackbird Creek system. Incremental progress might proceed based on actions implemented to date; however, total recovery is not foreseen without further active intervention by the mill. The Kimberly-Clark bleached kraft pulp mill

discharges effluent via the Blackbird Creek system into the Jackfish Bay area of Lake Superior. Contaminant levels in effluent and receiving waters have decreased since the installation of secondary treatment and changes in mill processes. As a result, the mill was able to reduce biological oxygen demand by 92%, suspended solids by 31%, and chlorinated organics (AOX) by 40%. Mill effluent presently has significantly reduced effects and is non-acutely toxic. Lake A was effectively removed from the Blackbird Creek system as a result of extensive accumulation of organic material. Following the cessation of effluent flow, recovery has occurred within a fairly short time span (~10 yrs) and at a minimal cost. Over time, Lake A has become established as a productive wetland.

The PAC established short and long term water use goals designed to restore and protect the beneficial uses of the Jackfish Bay AOC. Specific goals were developed through a series of public meetings involving representatives of various civic groups and the government agencies. The involvement of the public and their commitment to both rehabilitation and continued vigilance of the ecosystem are important to the success of the Jackfish Bay RAP. The cooperation, understanding, and stewardship that has been fostered thus far will undoubtedly continue to affect the community and its outlook on future environmental concerns.

RAP Milestones

✓	Stage 1 Report to IJC	submitted October 1991
✓	Public Use Goals	submitted November 1990
✓	Remedial Options Described	submitted July 1994
✓	Identification of Preferred Options	June 1995
✓	Draft Stage 2 Report released	December 1996
✓	Final Stage 2 Report released	February 1998

Priorities

The success of natural remediation is dependent on the support and commitment of the PAC, in addition to government agencies, industry, and the surrounding community. This strategy will require maintenance of high standards of effluent quality by Kimberly-Clark and continued monitoring of the AOC to document effects of historic deposits of contaminated material on the ecosystem. The mill was recognized as an example of the best available technology based on exemplary secondary treatment, changes in the bleaching process, and other mill improvements. The Jackfish Bay PAC has suggested that the mill operate with a closed process system thus eliminating the discharge of persistent toxic substances into Blackbird Creek. A closed loop system represents a significant technical advance towards recycling process waters and enhanced chemical recovery and reuse. Undoubtedly, a closed loop system would accelerate natural recovery of the AOC; however, until such time that funding becomes available to convert Kimberly-Clark to a closed mill, continued compliance with federal and provincial regulations, including increased chlorine dioxide substitution, will contribute to improving the water quality of the area. The following actions are still required in the AOC:

- ! The Ministry of the Environment's Surface Water Surveillance Program will continue to monitor the sediment and benthos of the AOC at least once every ten years.
- ! Continue with the Environmental Effects Monitoring Program for the pulp and paper industry every four years to determine the effectiveness of mitigative measures and to identify areas where improvements in mill processes are warranted.
- ! Continue to monitor contaminant levels in sport fish, at a minimum of every five years, until consumption advisories can be removed.
- ! Monitor sediment contamination and aquatic communities in Moberly Lake for incremental progress towards recovery.

Partners

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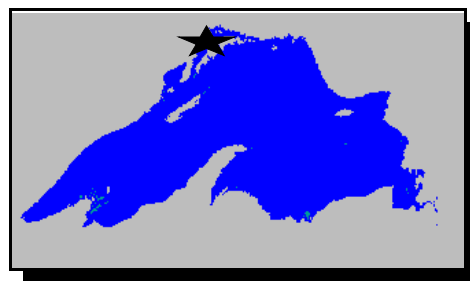
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Nipigon Bay

Area of Concern

Nipigon, ON, Canada



Background

Nipigon Bay is the most northerly area of Lake Superior. The AOC encompasses a large portion of Nipigon Bay and, its most notable feature, the Nipigon River. Originating at the outflow of Lake Nipigon, the river is the largest single tributary to Lake Superior and is an important source of hydroelectricity. The main stresses on the ecosystem of this area are related to water level and flow fluctuations in Lake Nipigon and the Nipigon River that result from the generation of hydroelectricity, discharge from the linerboard mill, accumulation of wood fibre, bark and other organic matter from historic log drives, and effluent from two water pollution control plants.

Beneficial Use Impairments

The five impairments of beneficial uses (✓) in the Nipigon Bay AOC require resolution before the area can be delisted. The loss of walleye and yellow perch fisheries and decline in the brook trout fishery can be attributed to degraded water quality, habitat loss, over exploitation, invasion of exotics, and sea lamprey predation. Lake trout stocks have also declined largely because of overfishing and sea lamprey predation. The benthic community is degraded in the vicinity of the Norampac (formerly Domtar) mill and the water pollution control plant outfalls. Algal growth on substrates in the lower Nipigon River is a concern. Aesthetics are impaired by the buoyant mill effluent from the mill and by industrial development along the waterfront. Losses of habitat in the Nipigon River occurred during historical log drives resulting in physical scouring, transport of substrate, and removal of instream habitat. Water level fluctuations from the generation of electricity continue to affect streambank erosion and sediment load.

Beneficial Use Impairments

Restrictions on fish and wildlife consumption.	✓ Eutrophication or undesirable algae.
Tainting of fish and wildlife flavor.	Restrictions on drinking water consumption, or taste and odor.
✓ Degradation of fish and wildlife populations.	Beach closings.
Fish tumors or other deformities.	✓ Degradation of aesthetics.
Bird or animal deformities or reproductive problems.	Degradation of phytoplankton and zooplankton populations.
✓ Degradation of benthos.	Added cost to agriculture and industry.
Restrictions on dredging activities.	✓ Loss of fish and wildlife habitat.

RAP Status

The completed Stage 2 RAP report expands on the Options Discussion Document for the Nipigon Bay AOC. The Remedial Action Plan Team and the Public Advisory Committee (PAC) evaluated an array of options to restore beneficial use impairments in Nipigon Bay and identified preferences for dealing with each problem. The assessment process was extensive, involving the identification of costs, advantages and disadvantages associated with each remedial option, and the rationale for the restoration of beneficial uses.

A number of projects have been completed to enhance fish and wildlife communities and to rehabilitate degraded aquatic and terrestrial habitat. Logs and debris were removed from historic spawning areas in the lower Nipigon River. Clean up of a former wetland site has resulted in natural regeneration of wetland features. A fish stocking program was used to rejuvenate the walleye population in Nipigon Bay with more

than 12,000 adult fish stocked over three years. A community based effort was used to clean up and restore habitat in and around a once productive and aesthetic brook trout stream. These efforts are a step towards enhancing fish and wildlife populations in the AOC.

The Nipigon River Water Management Plan was established, through public involvement, to reduce the impacts of the operation of hydroelectric dams on the Lake Nipigon/Nipigon River watershed and particularly on the Nipigon River fishery. The plan was in response to water level fluctuations that resulted in the exposure of brook trout spawning redds and affected the groundwater supply critical to the survival of brook trout embryos. The plan expands on an interim agreement between the Ministry of Natural Resources and Ontario Hydro to maintain minimum flows. By these actions directed at brook trout, other fish, wildlife, and benthic populations in the ecosystem will benefit by a more natural cycle of river flow.

Norampac has completed construction of an aerated stabilization basin for secondary effluent treatment. This treatment system reduces biochemical oxygen demand, toxicity, and suspended solids in mill effluent.

The Township of Red Rock initiated development of a marina/park on Nipigon Bay. Construction has been completed to overlay a standard armour stone breakwall with suitable habitat enhancements designed to increase diversity in the nearshore aquatic ecosystem, improve public access, and provide aesthetic and recreational opportunities to marina/park users. The completed breakwall is the first of its kind in Ontario and stands as a model for future waterfront development in the Great Lakes Basin. This demonstration project is directly applicable to marina developments as well as to a wide variety of structures designed to harden shorelines for the purpose of erosion control and/or storm protection.

RAP Milestones

✓	Stage 1 Report to IJC	submitted October 1991
✓	Public Use Goals	submitted October 1990
✓	Remedial Options Described	submitted April 1994
✓	Identification of Preferred Options	September 1994
✓	Draft Implementation Plan	October 1994
✓	Draft Stage 2 Report released	January 1995
✓	Final Stage 2 Report with Implementation Annex	February 1996

Priorities

The outstanding issue in the Nipigon Bay AOC is the implementation of secondary treatment at both the Nipigon and Red Rock Sewage Treatment Plants. Both plants currently discharge primary treated effluent into Nipigon Bay/River. The possibility of directing effluent from the sewage treatment plants to the mill's secondary treatment lagoons was examined; however, further study indicated that this option would be too costly. The alternative options are to build a new facility in Nipigon or upgrade the existing facility.

Additional water related issues in Nipigon and Red Rock include water infiltration into the sewage systems and an outdated water intake system in Nipigon that may require relocation in the future. Integration of a water conservation program into wastewater and water supply upgrades in both municipalities would be an economically sound course of action. A further effort will be made to implement water conservation strategies. Alternatives will be considered to costly upgrades and new plants, such as increasing the efficiency of the existing plants to reduce water uptake and outflow, resulting in lowered pollutant loading into the receiving waters.

The following recommendations have also been included in the Stage 2 report:

- ! Continue with baseline monitoring and review of Nipigon Bay fish populations.
- ! Conduct a benthic community assessment in the area adjacent to the mill outfall.
- ! Implement the Nipigon River Water Management Plan.
- ! Continuation of the Nipigon Bay PAC as an environmental committee, offering guidance and coordinating efforts and responses to environmental issues.

Partners

Great Lakes 2000 Clean Up Fund

Environment Canada

Ontario Ministry of the Environment

Ontario Ministry of Natural Resources

Ontario Ministry of Northern Development and Mines

Ontario Ministry of Education

Townships of Nipigon and Red Rock

Domtar Packaging

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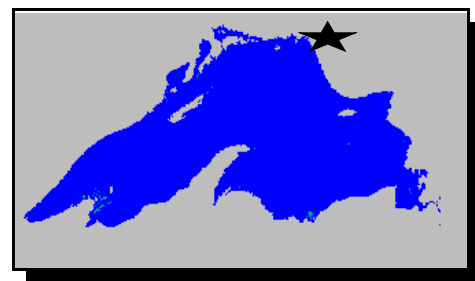
Peninsula Harbour Area of Concern

Marathon, ON, Canada

Background

Peninsula Harbour is located on the northeastern shore of Lake Superior approximately 290 km east of the City of Thunder Bay.

The AOC is roughly bounded by the watershed of the harbour and Pebble Beach, and extends outward approximately 4 km from the Peninsula into Lake Superior. The Peninsula Harbour AOC has problems associated with degraded fish and benthic communities and high levels of toxic contaminants in fish and bottom sediments. A number of surveys have been conducted to define the extent and magnitude of contamination with focus on the area of highest mercury levels adjacent to the former chlor-alkali plant. Large areas of the AOC exceed background mercury levels found in unimpacted regions of Lake Superior, either the result of high organic loads and mercury from log booming and chlor-alkali discharges, or as a result of high regional or natural mercury concentrations.



Beneficial Use Impairments

Peninsula Harbour was originally identified as an AOC in 1974 as a result of problems associated with bacterial contamination, aesthetic impairment, degraded fish and benthic communities, and high levels of toxic contaminants (ie., mercury and PCBs) in fish and bottom sediments. Five beneficial uses (✓) remain impaired or require further assessment to determine their status in the AOC. Mercury concentrations in suckers, an inshore obligate benthivore, are high enough to restrict consumption, indicating that nearshore mercury is bioavailable. Mercury levels in offshore species (ie., whitefish and lake trout) have declined significantly since the closure of the chlor-alkali plant in 1977. Insects are absent from the shallow water areas of Peninsula Harbour suggesting water quality impairment. Changes in benthic communities are consistent with elevated levels of organics rather than mercury toxicity. Dredging restrictions are in effect for sediments in Peninsula Harbour, particularly in Jellicoe Cove, where levels of mercury, PCB, chromium, iron, copper, and nickel exceed guidelines for dredging and open water disposal. Historic lake trout spawning grounds in Jellicoe and Beatty Coves have been destroyed through the accumulation of organic materials, such as wood fibre and bark, from log booming activities and effluent discharge.

Beneficial Use Impairments

- | | |
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| ✓ Restrictions on fish and wildlife consumption. | Eutrophication or undesirable algae. |
| Tainting of fish and wildlife flavor. | Restrictions on drinking water consumption, or taste and odor. |
| ✓ Degradation of fish and wildlife populations. | Beach closings. |
| Fish tumors or other deformities. | Degradation of aesthetics. |
| Bird or animal deformities or reproductive problems. | Degradation of phytoplankton and zooplankton populations. |
| ✓ Degradation of benthos. | Added cost to agriculture and industry. |
| ✓ Restrictions on dredging activities. | ✓ Loss of fish and wildlife habitat. |

RAP Status

Since the release of the Stage 1 RAP report, effluent from the Fort James-Marathon kraft pulp mill is now discharged through a submerged diffuser into Lake Superior near the secondary treatment basin. The secondary treatment facility consists of an aerated stabilization basin that is designed to remove organic pollutants in mill effluent. The former chlor-alkali plant, which operated adjacent to the pulp mill from 1952

to 1977, was the main source of mercury contamination to the harbour. Mercury contaminated material has since been removed from the plant and safely deposited at the Fort James-Marathon mercury disposal site. To date, there is no longer any free mercury at the chlor-alkali plant.

A draft Stage 2 RAP document has been completed that presents remedial strategies to address the beneficial use impairments in the Peninsula Harbour AOC, weighs each available option, and identifies the preferred course of action for the region. Participants at the 1992 Contaminated Sediments Workshop suggested that an appropriate strategy might be to focus on remediation of the shallow water areas of Jellicoe Cove where mercury levels exceed $6.0 \mu\text{g/g}$ while leaving remediation of the deeper areas to natural processes. It is likely that the high levels of mercury found in the nearshore areas provide a reservoir for the contamination of offshore sediments, and indirectly contribute to long term restrictions on fish consumption. Remediating sediments in the area of highest contamination would prevent further migration of nearshore mercury to offshore areas. For this reason, dredging and disposal of sediments from this area was chosen as the preferred course of action. A proposal has been submitted for the removal, stabilization, and disposal of the contaminated sediments. Dredged sediments would then be placed within a confined disposal facility (CDF), a specially engineered disposal site designed to minimize contaminant leaching into the surrounding watershed. Construction of a CDF could be incorporated into the marina development planned for the Carden Cove area of Peninsula Harbour. A thick cap of clean soil placed over the dredged sediments in the CDF would isolate contaminants from the surficial environment. When completed, the CDF berm would provide a protected, small boat harbour as part of the Carden Cove marina development.

The Peninsula Harbour Public Advisory Committee (PAC) developed specific water use goals and objectives designed to assist in the restoration and protection of the AOC. These goals provide community based guidelines for the remediation of beneficial use impairments. The success of the proposed remedial strategies is dependent on the support and commitment of the PAC, in addition to government agencies, industry, and the surrounding community.

RAP Milestones

✓	Stage 1 Report to IJC	submitted October 1991
✓	Public Use Goals	submitted December 1990
✓	Remedial Options Described	submitted May 1995
✓	Identification of Preferred Options	June 1997
✓	Draft Stage 2 Report released	July 1999

Priorities

Restoring the Peninsula Harbour AOC requires a corresponding long term plan to prevent future deterioration. Contamination problems could resurface from economic, urban, or industrial growth and development within both the AOC and the surrounding area. Therefore a commitment to pollution prevention strategies is required in order to prevent the need for future remedial actions. The Fort James-Marathon mill has taken steps towards pollution prevention methods to replace remedial approaches in dealing with environmental issues relevant to Peninsula Harbour. The mill's continued compliance with federal and provincial regulations will contribute to improving the water quality in this area. While removing sediments from the area of highest contamination might not restore full beneficial uses to the AOC, it would be a step towards improving environmental conditions by reducing exposure of some fish species and benthic organisms to shallow, high level mercury deposits. The following actions are required:

- ! Continue with the Sport Fish Contaminant Monitoring Program at least once every five years.

- ! The Ministry of the Environment's Surface Water Surveillance Program will continue to focus on Lake Superior every six years and, if requested, will monitor sediment and benthic community structure to track incremental progress in the AOC.
- ! Continue with the Marathon Waterfront Development Plan including construction of a marina.
- ! Habitat enhancement initiatives should be incorporated into any future development plans.
- ! Before dredging, sediment core samples are required to determine the depth of mercury contamination.
- ! A fish habitat assessment of the Carden Cove area will be required to determine the impact of the CDF on the local fishery.

Partners

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Town of Marathon

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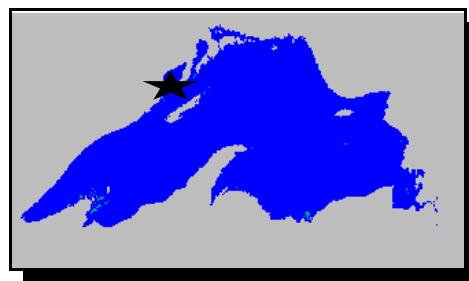
Thunder Bay

Area of Concern

Thunder Bay, ON, Canada

Background

The Thunder Bay AOC extends approximately 28 km along the shoreline of Lake Superior and up to nine kilometres offshore from the City of Thunder Bay. The Thunder Bay watershed is drained by the Kaministiquia River system and a number of smaller rivers and creeks. The greatest impacts on the AOC have resulted from industrial and urban development along the Thunder Bay waterfront and adjoining tributaries. Much of the industrial land within the harbour has been constructed through a combination of draining and filling of shoreline areas, including wetlands. Dredging, waste disposal, channelization, and the release of a number of pollutants have eliminated a significant portion of quality habitat along the waterfront. The consequences have been a loss of species abundance and diversity, reduced recreational opportunities, and a decline in the aesthetic value of the area.



Beneficial Use Impairments

Of the 14 Impairments of Beneficial Use defined by the Great Lakes Water Quality Agreement, 10 (✓) were deemed impaired or requiring further assessment to determine their status in the AOC. Impacts resulting from the release of process effluent into the Kaministiquia River and Lake Superior have been significantly reduced in recent years because of improved effluent treatment and changes in industrial processes; however, the ecosystem remains impaired in a number of ways. Fish consumption restrictions are in place based on tissue concentrations of mercury and/or PCBs and toxaphene. No point source of toxaphene exists in the AOC or on the Canadian side of Lake Superior. Liver cancers have been reported in white suckers possibly the result of exposure to PAHs in contaminated sediments. Negative pressures on fish populations have occurred as a result of the introduction of exotic species, habitat loss, discharge of organic waste, and in-place sediment contamination. Some areas of the AOC support benthic communities reflective of organic enrichment, contaminated sediments, and habitat loss from dredging activities. Dredging restrictions are still in effect because of sediment contamination in the harbour, particularly at the Northern Sawmills site. Elevated bacterial levels are also a concern as they present potential health hazards for water based recreational activities. Abandoned buildings, waste disposal, refuse, and industrial and residential development have impaired river and harbourfront aesthetics.

Beneficial Use Impairments

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| ✓ Restrictions on fish and wildlife consumption. | Eutrophication or undesirable algae. |
| Tainting of fish and wildlife flavor. | Restrictions on drinking water consumption, or taste and odor. |
| ✓ Degradation of fish and wildlife populations. | ✓ Beach closings. |
| ✓ Fish tumors or other deformities. | ✓ Degradation of aesthetics. |
| Bird or animal deformities or reproductive problems. | ✓ Degradation of phytoplankton and zooplankton populations. |
| ✓ Degradation of benthos. | Added cost to agriculture and industry. |
| ✓ Restrictions on dredging activities. | ✓ Loss of fish and wildlife habitat. |

RAP Status

A draft Stage 2 RAP report has been completed that outlines various strategies for remediation of the Thunder Bay AOC and documents the progress of remedial measures already under way. Strategies to address beneficial use impairments have been designed to increase aquatic and terrestrial habitat, enhance

recreational opportunities, and to improve the aesthetic value of the harbour and its tributaries. The highest profile remediation project is the Northern Wood Preservers Alternative Remediation Concept (NOWPARC). NOWPARC was designed to mitigate sediment contamination and to enhance existing habitat and aesthetic values. The remedial strategy is to isolate the source of contamination and treat contaminated sediments through a combination of containment, dredging, and capping. This project, in concert with other RAP initiatives, will help to improve water quality and sediment conditions in the harbour, and provide a hospitable environment for diverse biotic communities.

Many water quality issues have been addressed as a result of process changes and improved effluent treatment at local pulp and paper mills. Secondary treatment and 100% chlorine dioxide substitution at the Bowater pulp and paper mill have resulted in dramatic reductions in effluent BOD, AOX, and resin and fatty acid levels. Secondary treatment at Abitibi Consolidated has enable the plant to meet all requirements for TSS and BOD loadings to Lake Superior. These improvements are expected to enhance sediment and water quality conditions and encourage the return of healthy biotic communities.

Various fish and wildlife habitat rehabilitation projects have been completed along the waterfront and on tributary streams. These have included such things as improving walleye spawning habitat, restoring habitat diversity along floodways, creating nearshore nursery habitat and wetland sites, alleviating barriers to fish migration, and enhancing habitat diversity within dredged navigation channels. These efforts will increase the extent of productive aquatic and terrestrial habitat by rehabilitating and protecting wetland and riparian environments.

The involvement of the public and their commitment to both rehabilitation and continued vigilance of the ecosystem are important to the success of the Thunder Bay RAP. Community involvement has been evident in such projects as organized clean ups of the Thunder Bay waterfront and participation in Lake Superior Day celebrations and waterfront development workshops. The Public Advisory Committee plays a lead role in this process, making the public aware of progress towards the final goal of a healthy, balanced ecosystem and the ways in which this can be accomplished.

RAP Milestones

✓	Stage 1 Report to IJC	submitted October 1991
✓	Public Use Goals	submitted November 1990
✓	Remedial Options Described	submitted March 1995
✓	Draft Stage 2 Report released	July 1999

Priorities

With the installation of secondary treatment, mill improvements, completion of the NOWPARC plan, and numerous habitat creation projects in the AOC, it is expected that a compromise between the role of Thunder Bay as a working harbour and a natural ecosystem can be achieved. In this manner the harbour can provide a hospitable natural environment while remaining a viable part of the Thunder Bay economy. The following actions are required to alleviate the remaining use impairments:

- ! Secondary treatment at Water Pollution Control Plant
 Secondary treatment would reduce biological oxygen demand and annual loadings dissolved solids to the Kaministiquia River. An assessment of potential secondary treatment technologies has been completed and the City of Thunder Bay will conduct a pilot study of the preferred alternatives.

- ! Assessment of sediment mercury levels in north end of the harbour
Elevated mercury levels have been found in surficial sediments in the north end of the harbour adjacent to the Provincial Papers property. Recent surveys indicate that sediment mercury concentrations are lower now than in the early 1970s; however, total mercury levels exceed Provincial Sediment Quality Guidelines severe effect level of 2.0 µg/g. Further assessment is required to determine if remediation of sediments in this area is warranted.
- ! Continue with NOWPARC project
- ! Implement Slate River Watershed Management Plan
The plan recommends water management practices associated with agricultural activities in the Slate River watershed in order to reduce the impact of organic enrichment, turbidity, and sedimentation in the adjoining Kaministiquia River.
- ! Treatment of bacterial contamination at Chippewa Beach
Elevated faecal coliform levels have frequently resulted in beach closures. Remedial options have been presented designed to improve water quality in this area.

Partners

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Ontario Ministry of Natural Resources
City of Thunder Bay
Lakehead Region Conservation Authority

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